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PREFACE

Our Provincial Variation in Teaching Method

A careful survey of the field of teaching methods indicates a variation in modes of teaching which can scarcely be sanctioned by the versatility and freedom which they offer the teacher. In fact, the use of a great variety of methods is scarcely characteristic of the average teacher's practice though he has often repeated the just claim that he requires a large range of choice in dealing with children. Neither is a versatile series of methods of instruction characteristic of city and town systems of schools where an over-rigid uniformity of procedure is insisted upon far too often. The variation is geographical and institutional. One part of the country uses one method, and another a different one for the same purpose; or, the primary school emphasizes its own pet methods of procedure, while the grammar school holds to its own traditions, borrowing little from the school below. Variety here does not represent fertility of professional resource; it is a mark of professional provinciality.

Local School Government as a Cause

Our democratic political system has vested the control of the schools in the local authority. The Federal government may foster the organization of schools, but the states give them their actual form of organization. The state may lay down a minimum course of study, but the supervision of actual teaching,

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which is in any way really effective, is left to the local school superintendent. Thus the central business of the school, which is to teach children, is more highly local than its administration and business management. The result is that the modes of teaching utilized in American communities indicate a far greater variability than is either necessary or desirable, for they do not represent refinements of teaching procedure supplementing each other in the practice of a single teacher, as much as they do gross modes of attack used in different communities and slowly competing with each other for supremacy.

Supervision Toward False Uniformity as a Factor

Of course there has been a certain tendency toward uniformity in methods within single school systems. Who that has watched our recent tendencies could fail to note the false and disastrous application of this principle by its passionate devotees. Seldom has one institution suffered more in borrowing from another than in this crude transfer of a factory principle to the school. The superintendent and the principal of a dozen years ago who insisted on uniformity, generally fastened on to school or system a provincial or personal method without much rational inquiry into the relative value of known methods used in the same field. Hence, even the natural variation and selection of methods, which normally accompany the overlapping of community or institutional practices as their horizons broaden and their contacts increase, were lost to educational progress. Machine supervision has in many places actually defeated a normal and spontaneous improvement of teaching means. It has imposed a uniformity out of hand, when it ought to have been consciously seeking every known method of procedure and scientifically demonstrating the relative worth of each before rendering its judgment and issuing its command. Of course it is unnecessary to suggest that this older supervision toward a false uniformity is beginning to pass and that we are coming to know a different spirit and method.

Our Lack of a Professional Clearing House

It may be contended with proper show of argument that the teacher, principal, or superintendent, as the profession is at

present organized, is scarcely in a position to gather types of teaching method from the ends of the earth, to experiment with them in even a gross empirical way, and to give a more or less accurate relative evaluation of them. These practitioners are so pressed by the day's practical duties that there is little margin of energy or time for these extra duties that would redeem them from a narrow traditional or provincial practice of their profession. There needs to be some more or less central professional organization to gather, estimate, and disseminate professional knowledge. For this purpose our voluntary teachers' associations, both national and local, have been inefficient, and the United States Bureau of Education at the seat of government has hardly had funds for much real professional inquiry. Even with the funds at its disposal it has scarcely made a beginning in the collection and evaluation of teaching methods, though efficiency in this domain seems to be imperative in the ultimate educational service of the schools.

The Ensuing Waste

The task of bringing together our existing pedagogical knowledge has therefore been done in a haphazard fashion. A teacher here and there makes a study, a committee of some teachers' association makes a report, the university departments of education issue bulletins, magazine articles, and doctors' dissertations; but still the result is fragmentary and incoherent. Valuable variations in practice are overlooked and experiments are repeated over and over again by members of the profession who do not know of each other's labors. Thus, our limited energies for investigation are squandered for the want of a thorough organization of our facilities. In some manner, soon, we must capitalize and organize our small investigative energies so as to have a professional clearing house for our empirical and experimental knowledge of teaching methods.

The Function of this Monograph

In the meanwhile, awaiting the more competent organization of our profession, it is the obligation of individual men and institutions to contribute to the analysis and description of our methods and to lay the foundations for experimental work.

The two studies upon the teaching of spelling, presented in the TEACHERS COLLEGE RECORD, of which this study is the second,[1] are tentative efforts (1) to unify our knowledge of existing modes of instruction within a single school subject, (2) to estimate the worth of the existing ways of improving our teaching technique, and (3) to suggest a particular scientific and practical mode for determining the value of existing and suggested teaching methods.

In this particular study, actual experiments which have been conducted in the Horace Mann School are reported so that an understanding of experiments in comparative teaching may be had in concrete detail. In addition, a suggestive list of problems that require experimental investigation is offered. These do not call for any intrusion of radical methods into the school. They represent well tried methods widely used, the relative efficiency of which is in doubt. Experimental teaching with such methods involves no serious departure from well sanctioned practice.

The two monographs are the outcome of the joint effort of a practical school principal and a supervising theorist. It was necessary to know and investigate the methods current among American teachers for the purpose of finding out which were best to apply to the Horace Mann Elementary School of Teachers College. From another point of view there is expressed the attempt of a professional school for teachers to base its theoretical work upon the practical work of American schools. The School's need for better practice and the College's desire for more effective theory have been responsible for both studies.

H. S.

[1] Suzzallo, Henry, The Teaching of Spelling, *Teachers College Record*, November 1911, Vol. XII, No. 5.

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PART I

THE IMPROVEMENT OF INSTRUCTION IN SPELLING

CHAPTER I

TYPICAL MODES OF PROGRESS IN TEACHING

All Progress Not Scientific

It has been said with great frequency and with great stress that we have no well established scientific method in education, the implication being that we have no stable, certain, and expeditious way of improving our teaching practice. But neither the direct statement nor the implication, if true, means that teachers have no methods of progress. This would belie our educational progress, particularly that of the last half century. Our institutions have improved and they will continue to do so. But that improvement will never be as constant and effective as it might be, were our pursuit of progress conscious, the problems investigated practical, and the methods employed scientific. We need therefore to lay emphasis at this time on the conscious investigation of our practical problems by scientific methods. To assist in that purpose is the function of this monograph.

The Need to Understand All Modes

But in the effort to find a more accurate way of improving our teaching technique let us not neglect any of our present modes of progress. These can still be utilized in so far as they are under control. Whether they are or are not, it will still be necessary to understand them, for every influence for change which operates within a practical institution, such as the school, must work among many forces, each of which modifies every other. The prejudice of a well accepted tradition will dull the logical edge of the most convincing investigation; and a too exclusive faith in some particular truth of psychology may make one skeptical of experimental evidence upon other points. It would be well, then, if we could know the typical influences which now make for improvement in the methods of teaching spelling.

Typical Modes of Progress

There are many modes by which we advance in our teaching methods. Some of them are quite unconscious so far as the individual or the professional group is concerned; others are the conscious product of individual or organized group effort. Some are the result of a crude empiricism; others of a more refined scientific method. It is difficult to give a clear presentation of them apart from the concrete situations upon which they operate. But certain typical modes through which our professional practices are being improved may be indicated. No extensive treatment of the types is attempted. They are merely indicated in a general way, with such definitions and illustrations as are necessary to identify the movements for the ordinary professional teacher.

(1) *Daily Trial and Success*

Every teacher who is at all sensitive to the results of his teaching devices tends to vary his practice from day to day. Constant trial, with error eliminating and success qualifying a departure, is thus a source of progress. In time the new methods discovered by one practitioner are imitated by other teachers, and innovation is thus diffused.

We are unable to measure the degree of professional improvement which is due to this type of individual variation and its conscious or unconscious imitation. It must be considerable, judging from the way a single new practice will spread over the classrooms within a single unit of supervision. At least, its contribution seems substantial enough to warrant school systems in sending their teachers on tours of visitation without loss of salary. Many teachers are quite unable to apply a general principle in the modification of their work; let them behold the principle exemplified in concrete procedure and they readily adopt the new method.

The use of personal and class tests of spelling words in supplementation of the speller is a typical device which seems to have originated in the classrooms of individual teachers and spread through the imitation of teachers who have seen it in operation or heard it described. At least, such a detailed change seems not

to be the product of any distinct professional agitation. A similar force seems to have been behind the spread of conversation as an introductory basis for the spelling period, the " flash card " method of forcing the child to focus his attention on visual form, and the pronunciation of words both before and after letter-spelling of words.

(2) *Experimentation of Progressive Teachers*

Closely akin to the " trial-and-success " improvement just mentioned is the deliberate, experimental teaching of progressive teachers. In the situation mentioned above, the modification of procedure is general, the total method of teaching a given phase of spelling being reconstructed very slowly, many aspects being modified many times before a changed complex is fixed as a whole. It is a product of crude but effective empiricism, the result of a kind of pedagogical groping. It is hardly experimental in the sense that the teacher is fully conscious that the method as a whole is " brand new," and that its first uses are quite tentative. In real experiment some new idea or device occurs to the teacher of original mind, and it is tried out with its worth in question. If a fair proportion of successes ensue, the method is accepted as a new technique within the teachers' equipment. The teacher may become an enthusiast in his discovery and vigorously apply the newly discovered method to many situations in spelling, urging it as a panacea for many difficulties. Many of our " one-idea " methods have had their origin in the individual experiments of progressive teachers. The reconstructions of our spelling teaching, which come in this way, are likely to be far more radical than the results which come by way of the slower process of " trial, error and success." Some of the devices for focusing the child's attention on irregular and difficult parts of words, such as the use of colored chalk and mnemonic devices, are produced largely by such individual experimentation. The exclusive use of words which can be objectified or acted out in the teaching of spelling is another conspicuous example of a system of teaching which is thus developed and extended.

(3) *General Pedagogical Movements*

Both the modes of improvement mentioned start with concrete devices or systems of instruction. In these cases a new concrete procedure substitutes itself for or modifies a more traditional concrete procedure. There is another type of reform movement which works upon the details of instruction through changes in the underlying professional thought. Sometimes these pedagogical movements operate within a special subject, and sometimes they influence the whole attitude of the school, touching all fields. It is obvious that general pedagogical movements which influence the professional attitude of teachers will influence the special methods of teaching spelling. The wide tendency toward making all school work vital and interesting to the child has made spelling methods much less formal. The Herbartian doctrine of correlation brought spelling into closer touch with other subjects and emphasized the need to understand the meaning and use of words. The developmental method of instruction changed the nature of the spelling period so that children were taught, not merely examined. Whatever affects the viewpoint and professional attitude of teachers naturally influences spelling along with other subjects. Spelling participates in each wave of general educational reform.

(4) *Special Pedagogical Movements*

Frequently, spelling methods are changed by pedagogical influences local to itself. The subordination of the spelling match is a case in point. The reaction against word analysis as an aid to spelling is another. Of course these particular changes never occur as the result of some movement special to the subject alone; other forces for reform supplement and reinforce. Nevertheless, there are changes in instruction which are dominantly determined by the problems peculiar to spelling and by the discontent which arises with the traditional technique employed to solve them.

Because of the peculiar secondary place which spelling occupies as a subject in the elementary curriculum, it has been modified less than other subjects by reforms arising within the subject itself. But more than other studies, for the

same reason, it has had its technique modified by special reforms arising within the other disciplines with which it has been connected; e. g., reading. Changes designed to affect the special methods of teaching beginners to read have always had a delayed but certain influence upon instruction in spelling. One has only to call attention to the special use of syllabication, diacritics, and phonograms in both reading and spelling to establish this point.

(5) *Reconstruction Through Psychological Criticism*

As time has passed it has become more clearly recognized that we could not depend solely upon the methods of empiricism or those of a philosophic pedagogy for improvement in teaching. There is a growing recognition that in so far as teaching method is an adjustment to the mental nature of children, its efficacy rests upon a knowledge and application of psychological laws. More and more we recognize that psychology is the most important scientific basis for effective teaching. Here the improvement of spelling instruction enters definitely into its scientific background, and psychology has done much to criticize and reconstruct old methods of teaching and to suggest new devices. The method of multiple association where eye, ear, throat, and hand are used to give to the pupil a full rich impression of a word is a constructive suggestion of psychological thought. The emphasis upon habit-formation in the correction of spelling errors is another. The use of visualization and copying to the neglect of pronunciation, in the case of irregular words, has its origin in psychological modes of attacking the spelling problem.

(6) *Studies in the Special Psychology of Spelling*

With the growing reliance of methodologists on a general scientific psychology, it is quite natural that a special psychology of spelling, more intimate to the problem than a general descriptive and dynamic psychology, should be sought. Experimental psychology has been utilized to study the special psychology of spelling processes. Unfortunately these have not been numerous, nor have they been very influential in current practice. For the most part they have tried to reveal the nature of spelling errors

and to indicate the varied causes of mistake.[1] The more numerous and important studies in the special psychology of reading have perhaps had more actual influence on the teaching of spelling than the inquiries conducted within the field of spelling. The reason for this is clear when one realizes that similar elements are present in both cases. When the young child reads, he proceeds from the printed symbol to the pronunciation and meaning; when he spells in spontaneous composition he proceeds from his meaning and pronunciation to the written letters. Spelling is a kind of reverse reading process. Of course there are differentiating elements which make very important differences; but the special psychology of one field is in degree applicable to the other. Hence the influence of psychological theories of reading on the teaching of spelling.

(7) *Investigations of Existing Conditions*

At best psychology is still remote from pedagogy. Pedagogy deals with complex and dynamic situations, while psychological experiment is mostly concerned with relatively simple phenomena under conditions of artificial simplification. Teaching method, too, is a synthetic art, while psychology is an analytic science. While psychological truth may be very valuable to pedagogics, the spirit of scientific inquiry which psychology has introduced into education can be more useful than the truths rendered by this basic science. The direct scientific investigation of existing methods of teaching has already been attempted by American educators. Usually, these have investigated the efficiency of teaching methods in their relation to conditions of administration and supervision, the arrangement of time schedules, and similar factors. The investigations of Cornman and Rice are typical. Rice pointed out the large waste in the drill method of teaching spelling and suggested that a fifteen minute period each day will suffice for adequate learning.[2] Cornman

[1] Foster, W. T., The Spelling of College Students. *Journal of Educational Psychology*, Vol. II, No. 4, April 1911, pp. 211-215. Also Burnham, Wm. H., The Hygiene and Psychology of Spelling. *Pedagogical Seminary*, Vol. XIII, 1906, pp. 474-501.

[2] Rice, J. M., The Futility of Spelling Grind. *Forum*, April and June, 1897.

showed that good incidental instruction in spelling can be as effective as the special instruction given through regular study and recitation periods.[1] Studies of this type have stimulated thought, inquiry, and experiment. They have been far more valuable in the impetus they have given to investigation than for the conclusions they have offered. They have by no means decided the intrinsic value of one type of teaching as opposed to another. They have merely suggested the inefficiency of typical methods of teaching as these are used in current practice. The different ways teachers have of using methods bearing the same pedagogical title have not been carefully distinguished, and there has been inadequate control of conditions in the submission of tests. These objections have been clearly stated in Wallin's careful study of more recent date.[2] Nevertheless these gross investigations of educational conditions have been productive of good. They have forced schoolmen to become skeptical of conditions and methods associated with the spelling period. Certainly they have stimulated much psychological criticism and much individual experimentation upon the part of teachers and supervisors. Their very defects have shown the need for more careful investigation of current practices, and have revealed the necessity for a comparative study of teaching methods under carefully controlled experimental conditions.

(8) *Comparative Studies in Experimental Teaching*

The latest source of progress in teaching method is found in the refined methods of modern experimental pedagogy. Typical of these are the studies of spelling made in the Horace Mann Elementary School of Teachers College, Columbia University, by Principal Henry Carr Pearson, with the co-operation of the staff of Teachers College.[3] They represent practical investigations of the relative value of methods actually used by American

[1] Cornman, O. P., Spelling in the Elementary School, 1902.

[2] Wallin, J. C. W., Has the Drill Become Obsolescent? *Journal of Educational Psychology*, Vol. I, No. 4, April, 1910, pp. 200-213; see also Wallin, Spelling Efficiency in Relation to Age, Grade and Sex, and the Question of Transfer. Baltimore, Warwick & York, 1911.

[3] Pearson, Henry C., The Scientific Study of the Teaching of Spelling. *Journal of Educational Psychology*, Vol. II, No. 5, May 1911, pp. 241-252.

teachers, conducted under scientific conditions with a minimum of artificiality, and interpreted by statistical measures of growth. As a type of method, such comparative experimental teaching represents one of our best scientific instruments for improving our teaching procedure.

CHAPTER II

COMPARATIVE EXPERIMENTAL TEACHING AS A CONSCIOUS MODE OF PROGRESS

Our Limited Control over Certain Conditions of Progress

In the improvement of our professional methods our object must be to make progress increasingly a conscious matter. Waste and inefficiency which are eliminated by natural forces, by the critical intelligence of thoughtful teachers, and by the periodic enthusiasms which accompany some cult of general or special reform, are only partly within our control. They cannot be directly manipulated; we can only extend the conditions which favor them by obtaining better trained teachers, by giving them a supervision which is stimulating, sympathetic, and intelligent without becoming mechanical and coercive, and by organizing and administering schools so that real progressive teaching is not hampered. But we require more direct and positive means of progress. Once we have adequately established the purposes of the school through a sound sociology, we then face the necessity of criticizing and reconstructing our educative processes,—i. e., our methods of teaching,—on the basis of objective data and the generalizations directly derived from them.

Our Direct Control over Psychology and Pedagogy

There are two distinct domains of professional study wherein the educative processes of the classroom may be given a conscious basis in terms of scientific data and generalizations. (1) As all teaching methods are in a sense an attempted adjustment to the mental nature of children, pedagogy must have consideration at every moment for the laws of mind. A knowledge of psychology is basic in every conscious treatment of methods of instruction. (2) As teaching processes are complexes deter-

mined by many factors and considerations, the efficiency of each unitary method must be determined on the basis of its concrete effect on the situation it is designed to meet. A practical classroom pedagogy ought to rest upon the conclusions of an experimental pedagogy. To the extent that we can connect psychology with current practice, and can determine by scientific trial and comparison which are the most efficient teaching methods, to just that degree we have armed the profession with weapons for aggressive and stable progress.

The Improvement of our Educational Psychology

Our uses of psychology in education improve constantly, but not enough. As general psychology fills out the gaps in its own knowledge, we need to avail ourselves of the new contributions. The teacher, save in moments of failure, intellectual discontent, or professional study, is not psychologically-minded in the selection and rejection of teaching methods. It is far from certain that he should be. There is a type of self-consciousness which would seriously disturb the results of teaching as a fine art. But the supervisor of teachers has no such excuse or defence. It is his business to analyse, for his is a critical purpose. Yet the average supervisor is merely a promoted teacher, imposing his own practices on the teacher without much consciousness of the psychological "why or wherefore!" Until the supervisory staff have as good knowledge of the psychology underlying educational processes as they have of the teaching processes themselves, they have not contributed their due share to our professional growth. Our defect here is not so much a lack of knowledge as it is a failure to relate the psychology we have to our classroom practice.

But a general psychology, just because it is general, fails to appeal to and assist the educator as much as psychology might. With its wide reaching laws, it is frequently too remote; it lacks detail just where pedagogy pleads for a mass of concrete suggestion. Of late the psychologists with a pedagogical interest have been hastening to remedy this defect. They have been giving study to the psychology of the special school subjects, spelling among the rest. The school subjects of reading and

penmanship have been specially favored. Spelling has had some consideration, but needs much more. If the experimental psychologists will investigate comprehensively the special factors involved in the learning of spelling words, we shall gain a much needed special psychology, the value of which will be great for critical purposes.

The Relation of Experimental Pedagogy and Educational Psychology

At best, however, general and special psychology can only provide a basis in scientific fact; it has still to be applied among all the intricacies and variations of teaching practice. The spirit and method of science should be carried directly into the field of pedagogy itself, investigating the success of the practical units of classroom procedure. Then we shall be surer of an objective footing for the traditional practices we maintain and the changes we adopt. The conjectures we make as to the bearing of general and special psychology may themselves be tested and brought to strict measure. We can escape, too, that isolation and unnaturalness which always accompany the work of the laboratory experimentalist. However richly the experimental psychologist may provide accurate information on special points involved, the teacher still fails readily to combine these points into the complex thing we call a method. Experimental pedagogy will help to eliminate the errors that arise in applying psychological knowledge to teaching procedure.

The Practical Advantages of Experimental Pedagogy

There is always a large gain to a practical profession when science concerns itself with procedure rather than with the isolated principles and laws underlying it. The members of the teaching craft as a mass have always been more responsive to experiments in pedagogy, however crude, than they have to the suggestions of a more or less abstract psychology. Thus pedagogical experiment by some instructor or school system readily attracts the attention of teachers.

A large store of suggestive knowledge in the texts on general psychology and the monographs on special psychology lies

neglected. This is due partly to the fact that teachers do not know psychology and cannot handle it readily, and partly to the fact that the knowledge must be applied before it is useful. In a pedagogical experiment, the reconstruction is objectified; it interests because it deals in a direct manner with the teacher's own practice; it can be seen and judged without much mental complication. Thus teachers discontented with their own work and eager for remedial change are often caught by some device, or by the systems of enthusiastic educational reformers, when their psychology could tell them better. It is for this reason that the studies made of spelling instruction in the school by Rice and Cornman have attracted so much attention among school men, stimulating both discussion and change. These studies dealt with investigations of method under school room conditions, and any teacher could appreciate their force.

The Worth of Early Investigations of Spelling Efficiency

These concrete investigations into the efficiency of spelling instruction were pioneer efforts. Their influence has been much greater than the scientific weight of the conclusions offered. They initiated inquiry and suggested a method. They were better than the crude empiricism of individual teachers as they dealt with a mass experience; they were better than the coincident judgment of large groups of teachers because they rested on objective data interpreted by some statistical measure. But they were defective in that they did not sufficiently control the conditions of the teaching or the testing that gave the evidences for interpretation. They lumped together under a single mode methods that were unlike save in name. In general the conditions surrounding the studies were not sufficiently controlled to permit of safe final conclusions.

Some Essentials of Good Pedagogical Experimentation

Taking a hint from our professional history, we need to develop a more accurate investigative pedagogy, for the practical appeal of its truth has a marked effect upon teachers and makes reform an easier matter. In the combination and use of such a method several qualities will be essential. (1) The experimen-

tation will deal with method wholes; (2) the point at issue will be the relative efficiency of two or more methods; (3) the efficiency will be measured in terms of growth in the pupil's power, rather than by comparison with any standard of perfection; (4) the experiments will be conducted under normal schoolroom conditions, the factors not under investigation being distributed in counterbalance among the several selected classes, teachers, and grades; (5) the preliminary and final tests, and the intervening instruction, will be under strict control without creating abnormal situations; and, (6) the interpretations will be made through the aid of modern statistical measures, carefully checked by the method of critical analysis. An attempt has been made to meet these conditions in the pedagogical investigations conducted by Teachers College in its school for demonstration—the Horace Mann Elementary School. For convenience the particular form which the investigations have taken has been called the Method of Comparative Experimental Teaching.

A Problem in Comparative Experimental Teaching

The method of inquiry may be best suggested by the citation of a concrete problem and its treatment. There are two opposed attitudes in the teaching of homonyms (hear, here; their, there), words meaning separate experiences, pronounced more or less alike, and spelled differently. One set of schools contends that homonyms should always be taught in isolation from one another, so that the child learns the meaning, pronunciation, and spelling of a single word as a complete series, unassociated with any other. This view holds that bringing a pair of homonyms into the presence of the child only complicates the situation by confusing the child. A second set of schools takes exactly the opposite point of view, that homonyms which are likely to be confused with each other ought to be taught together in the same lesson. If confusion exists, then the only way to deal with it is to face it consciously and, by comparing the two forms, differentiate them from each other by showing that their meanings and spellings are different even though their sounds are similar. A third set of schools maintains that both methods

should be utilized in the school system. The contention is that a method of separation is best with young children where the confusion has not yet arisen, and that the method of comparison is superior with the older children where there is a confusion to be eradicated. The opinion of these eclectics is that each method is better than the other in a particular situation,—the method of separate study being best as a preventive, i. e., in proceeding from ignorance to knowledge; and the method of comparison being best as a corrective, i. e., in progressing from error to knowledge. The practical problem of the educator is to determine which of these views is nearer the correct one.

The Manner of Experimenting With the Problem

(1) *Aspect selected.* A single aspect of this controversy may be made the subject of comparative experimental teaching,—namely, the corrective power of the two typical methods in dealing with the misspellings of homonyms.

(2) *Classes chosen.* A school, large enough to provide at least two classes of every grade in which homonyms are taught, should be selected for the experiment. It would be still better if there were four classes of each grade, though a second experiment in another school of fewer classes might be used as a check.

(3) *Initial test.* All the classes should be given a graded test so that some errors would be committed by pupils of every grade. The tests should be made hard enough to insure this. This test can be best given by one person, say, the principal.

(4) *Equating conditions.* Then the classes should be separated into two parallel groups, one set of classes from the second to the eighth grade to be taught by the method of separation (method S), and another by the method of comparison (method C). But such a distribution of the mode of teaching does not sufficiently equate conditions except gross grading of the pupils. As many additional factors as might possibly influence the experiment should be equated. Here the school principal's knowledge of his classes and teachers will be of great service. If a third grade class, to be taught by method S, seems less able in spelling than the other group of the same grade, then this should be counterbalanced by assigning an apparently less able fourth

or fifth grade to method C. In the same way, the teachers and other factors may be taken into account, until the conditions under which both methods are to be taught seem fairly equal. Thus the danger that factors, other than those under investigation, will vitiate the experiment would seem reduced to a minimum. In considerable degree such an investigation would really compare two total situations in which one distinct variable is deliberately provided.

(5) *Safeguarding uniformity of method.* The principal, or whoever is in charge of the experiment, should meet the teachers of each group and carefully lay out each mode of instruction, so that practically the same procedure is employed by all in charge of method S or method C. The regular classroom teachers will, of course, always teach their own classes so as to preserve a normal situation. The homonyms can be taught along with other words precisely as might occur in the usual routine of the school, but the time distribution, etc., should be arranged so that conditions are alike among all the classes and grades. A printed slip of procedure for the teacher will assist.

(6) *The final test.* When the teaching of the homonyms is completed and there has been a lapse of time sufficient for the fading out of weak impressions, the test should be readministered for comparison with the initial test. The person giving the initial test should give the final test.

(7) *Comparing the two methods.* The individual growth of each child and each class should then be measured and the effect of the two methods of teaching compared. Modern statistical methods should be used in these measurements and comparisons, and the whole study should be critically analyzed, additional experiments being given to check doubtful points. The concrete studies given in full in the second part of this monograph will suggest the whole procedure in detail.

Advantages of the Method

The advantages of such a method of comparative experimental teaching over previous methods of investigating pedagogical efficiency have been anticipated by the general discussion. As the problem investigated is one which already exists in the teacher's

mind, he is likely to be deeply interested in the conduct of the investigation because of its practical implications. The use of the regular staff of a single school makes it possible to administer the tests and give the instruction under normal conditions. The selection of a single school makes it easier for the investigator to counterbalance those factors, secondary to the purpose of the experiment, which might mar the results of the experiment. The whole situation is normal; the whole experiment is under control. Even the statistical computations and interpretations need not disturb the average principal or teacher as these may be made with the assistance of any expert in modern methods. All in all, comparative experimental teaching is one of our best modes of contributing progress to our teaching methods.

CHAPTER III

PROBLEMS FOR EXPERIMENTATION

The teaching technique employed in spelling offers very fruitful ground for the application of methods of comparative experimental teaching. The controversies rage here as they do in few other subjects. And every dispute involves a disagreement as to psychological truth which can be solved only by appeal to facts carefully garnered and interpreted. Some of these disputes are here listed. The list is by no means complete; it aims merely to suggest a somewhat extensive series of problems typical of those requiring solution. For the most part the disputes which mainly concern the psychologist and the educational theorist are omitted. Such as are here cited represent actual oppositions in school room practice, to considerable extent the subject of present debate among men and women responsible for teaching children. Courses of study, manuals of method, text-books and books on special method, representing every angle of practice and every geographical location, have been examined and compared so as to discover the divergent practices, which are supported by different assumptions and opinions.

Necessarily many of the problems overlap. Not all the problems here suggested are to be solved exclusively by laboratory experiment or experimental teaching; some involve sociological inquiry. Hence they are not stated in the definite form in which the experimentalist must finally cast them; but in the somewhat general terms current in the discussions and presentations of practitioners. Thus the appeal for careful experimental teaching of a comparative sort will seem real and valuable to the thoughtful and progressive teacher as well as to the educational scientist.

Spelling Vocabularies

(1) *Size of common vocabulary.* Assuming that in his adult life the child will spell only when he expresses himself in written

form, about how many fundamental words ought all elementary school children command by the end of the eighth year? Will this be determined by a study of high school compositions, by an investigation of the best eighth grade compositions upon varied topics, or by some combination of these and other methods?

(2) *Source of words.* Shall the actual words taught in a given school be drawn from the language compositions alone, from the readers, from other school texts, from a specially prepared spelling book, or from some combination of these? Should the source of words vary as the child progresses from the lowest to the highest elementary school grades?

(3) *Selection for special groups.* To what extent ought the spelling vocabularies vary for schools made up of children recruited from a special social class, i.e., foreign born, native born of foreign parents, unfavored culture population, etc.? To what extent should the school's standardizing function modify these special adjustments?

(4) *Transient use of words.* To what degree are words, the spelling of which is taught during the study of some special topic, transient? Do such words, unexercised by ordinary composition usage, quickly fade out of the child's mind once the special subject is passed? How far is instruction in the spelling of such words within the spelling period valuable?

(5) *Supplemental spelling lists.* How far does efficient teaching in spelling require that the adopted text in spelling be supplemented by grade lists (to meet the special courses of study of the particular school system), class lists (to meet the spelling needs created by activities of a particular classroom), and personal lists (to meet the child's individual choice of words)?

The Grading of Words

(6) *Principles of grading.* Shall words be graded by length, irregularity, or familiarity of meaning and use? What special difficulties make one word harder than another?

(7) *Reformed spelling.* Will reformed spelling materially decrease the difficulties in the teaching of spelling? Or will the

elimination of irregularities diminish attention on the structure of words?

(8) *The delay of irregular words.* Is it more feasible to begin spelling exclusively with regular words, rapidly extending the vocabulary through interpretation of many new words by structure-sound analogies; or to restrict the vocabulary to the child's usage, spelling both regular and irregular words as they occur without special segregation?

The Presentation of Words

(9) *Grouping for presentation.* What principle shall determine the grouping of words within a single lesson presentation, (a) phonetic structure or (b) meaning and use? What are the relative strengths and weaknesses of presenting necessary words, (a) in columns of uncorrected words, (b) in sentence or paragraph dictations?

(10) *Order of supplementing.* If several classifications are used in supplementation of each other, shall the word be first presented in isolation followed by sentence use, or *vice versa?*

(11) *Initial presentation.* What is the relative worth of first presenting words experientially (through manipulation, objects, pictures, etc.) as against presenting them orally (oral spelling), or visually (flash cards, copying)?

(12) *Motivation and regularity.* Are irregular words, which the child has motive for using in self-expression, easier or harder to teach than regular words which are not within his personal experience and need?

(13) *Intrinsic and extrinsic motivation.* What is the relative effect on ultimate efficiency in the learning of spelling: (a) when the oral or written spelling is drawn from the child's own vocabulary; (b) when the social competition of the spelling match, the ambition for school marks, detention after school, etc., and other extrinsic motives are used?

Factors Associated in Spelling

(14) *Association of spelling factors.* Assuming that the ability to spell involves the association of three factors, (a)

meaning, (b) pronunciation, and (c) order of letters, how shall each of these factors be best established in the child's mind?

(15) *Teaching the meaning.* If a child in any normal spelling situation starts with a meaning, how is the meaning of a strange word to be given? What is the relative value of getting the meaning, (a) from direct objective experience, as in action, picture and object lessons, (b) from a definition, (c) from the context of language informally and formally used, (d) from the use of the dictionary?

(16) *Pictures.* To what extent will the use of pictures in spelling, as in other modern texts, increase the ease of teaching the meanings of words?

Teaching Pronunciation

(17) *Modes of obtaining pronunciation.* How far shall children get the pronunciation of a word, (a) from the sound model of another person, (b) by some method of phonetic translation of the spelling, as in the use of diacritics, syllabication, and the phonogram, (c) by the use of the dictionary, with direct diacritical interpretation or by an analogical transference of sound from a known word at the bottom of the page, similarly marked?

(18) *Sound units.* What is the relative value of alphabetic, phonetic, diacritic-phonetic, syllabic, and phonogrammic units in teaching the pronunciation and spelling of words?

(19) *Diacritics.* How far is it necessary to learn the diacritical marks to assist children in determining pronunciation? Is the method of analogical transfer of known sounds to unknown words, similarly grouped or marked, a better method?

Teaching the Order of Letters

(20) *Modes of learning the order of letters.* In mastering the order of letters for writing purposes, what is the relative worth (a) of the method of translation from sound, (b) of visualization, (c) of copying, (d) of oral spelling, (e) of the use of the dictionary?

(21) *Quick visualization.* Is flash card work (the photographic method) superior or inferior to that exposure of the

letters of words which the child gets when the teacher exposes the word only while he is writing it?

(22) *Attention devices.* How valuable are special devices for focusing attention on irregular or regular parts of words, such as underlining, the use of colored chalk, syllabic or phonogrammic divisions, etc.?

(23) *Print and script.* Considering that the child will finally have to spell in writing, is learning of spelling from script more efficient than learning from print?

Associating the Various Factors in Spelling

(24) *Order of impressions.* What is the best order for getting all the factors associated in spelling work, assuming that the following are important elements, (a) mental image or idea of meaning, (b) motor associations therewith, (c) auditory impression, (d) oral expression of the same, (e) visual impression, (f) written expression of the same?

(25) *Multiple association and repetition.* Which gives the most efficient mastery of spelling words, the multiple association gotten through all six impressions cited above, or the extended repetition of a restricted series of these (pronunciation, oral spelling and pronunciation; or visualization and copying)?

(26) *Order of associations.* Of the three important factors to be mastered, meaning, pronunciation, and spelling, three different associations of them are to be made, (a) meaning and pronunciation, (b) meaning and spelling, (c) pronunciation and spelling. Is there any best order for making these associations, assuming that most children go from meaning, to sound, to spelling, and that many adults go from meaning direct to spelling, frequently getting the pronunciation afterward? Are other orders useful and permissible?

(27) *Order modified by irregularity of words.* The spelling of some words follows the sound with greater closeness than others. Will there need to be a different emphasis upon the impressions and associations to be connected in the mind of the child in the case of words that are irregular in their spelling?

(28) *Effect of meaning on drill.* Does the contentful spelling period, one that is rich in objective and active experiences, decrease the amount of drill and review traditionally required to fix the spelling of words?

Isolated and Contextual Spellings

(29) *Their relation.* How far does mastery of a word in isolation (oral or written spelling of single words or of a list of words) give the ability to spell a word in context or spontaneous composition?

(30) *Groupings of words in lists.* To what extent shall words grouped in lists have (a) common rule of spelling as the basis, (b) common roots, suffixes, or prefixes, (c) common phonograms, (d) unity of association in their meaning (as when all words are names of colors, tools, etc.)?

(31) *Types of contextual spelling.* How far does mastery of the spelling of a word in context vary when the work represents (a) dictation, (b) formal composition, (c) natural composition?

Doublets

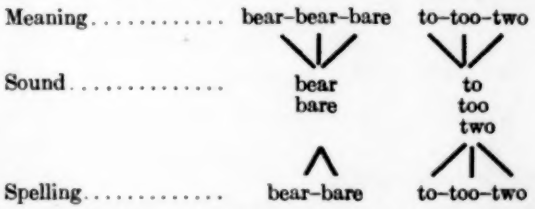
(32) *Comparative and isolated teaching of doublets.* There are certain words, sometimes called "doublets," which are confusing to the child when he spells them, e.g., "their" and "there." Different assumptions are made with regard to the teaching of these. Some assume that they should be taught in the same lesson by comparison and differentiation. Others assume that they should be taught in complete isolation from each other, without comparison and distinction. The further point of view is taken that one method is best for primary children, and that the other is best for more mature children. How true are these respective contentions?

(33) *Relative confusing force of various types of doublets.* The ordinary spellers take note of only a few of these, such as homonyms, homophones, synonyms, antonyms, etc., assuming that other types of doublets do not deserve special attention. How far are the stock doublets of the spellers representative of

the prevalent difficulties? The following chart of doublets is given as a suggestive list.

(34) *Simple doublets.*

(35) *Complex doublets.* How far can the methods of treatment of various types of simple doublets be applied to complex doublets, where two or three forms of confusion are found?



(36) *Pseudo-doublets.* How far can the methods of teaching simple doublets be applied to pseudo-doublets, where there is no coincidence of meaning, sound, or spelling, but merely a similarity? Where the doublets are similar only in origin, opposite in meaning, and different in sound and spelling?

Testing Efficiency

(37) ***Oral and written tests.*** How closely does oral letter spelling of words imply ability to spell in written form?

(38) *Column and contextual spelling.* How far does ability to spell detached words in columns assure ability to spell words in connected sentences?

(39) *Dictation and composition.* How closely does the power to spell words correctly from sentence dictation carry over into spontaneous composition?

Correction of Spelling Errors

(40) *Stages in correction.* What steps or succession of psychological stages are necessary in the complete correction of any spelling error? How will they differ in so-called *substitutional* and *inhibitional* methods?

(41) *Methods of correction.* What is the relative value of the inhibitional and substitutional methods in the correction of spelling errors? What relation do they bear to the efficient correction of errors, (a) by the teacher, (b) by the pupil himself?

(42) *Sense of doubtful spelling.* As an initial stage in getting the child to correct his own spelling, how may he best become aware of his misspellings, (a) by a check mark, (b) by personal comparison of spellings?

(43) *Acquisition of correct form.* If a child has misspelled a word, is it better (a) to present him with the correct form outright, (b) to let him guess at the probable error through word study or word analysis, (c) to have him consult the dictionary?

(44) *Habituation of correct spelling.* How far must the teacher himself drill the child in the correct form so as to make the right spelling completely habitual? How far can the child be left or be trained to do this for himself? What check must the teacher retain on the independent effort of the child?

Aids to Independent Power

(45) *Use of dictionary.* What is the earliest school year in which children can be taught to use the dictionary with permanent profit?

(46) *Preparatory dictionary drill.* What facts are essential in teaching children to use the dictionary and in what order may they be best taught?

(47) *Word study.* Are children better independent spellers of words when their spelling instruction has been accompanied by word study? Is word analysis more or less effective than word building (synthesis)?

(48) *Rules.* Are children better spellers when their word spelling is accompanied by a mastery of spelling rules? Which spelling rules are most valuable? How may they be best taught?

The Spelling Period

(49) *Number of words assigned.* With a graded list of words, what difference in the number of words assigned from the lowest to the highest grades shall be observed? How many more words can be learned in a fifteen minute period by a seventh grade pupil than by a third grade pupil?

(50) *Time assignment.* What is the most economical quantity of time to be assigned to regular instruction in spelling in the various school grades?

(51) *Subdivision of time allotment.* Assuming the same time allotment per week, are five short daily periods better than two or three longer ones? Would the advantage or disadvantage be the same for all grades?

(52) *Incidental and class spelling.* Can spelling, taught incidentally in connection with the other subjects, be made as effective as systematic instruction during regular spelling periods? To what extent do fundamental conditions of organization now existent affect each of these two modes of instruction? Is incidental instruction more effective in primary, intermediate, or grammar grades?

(53) *The range of formal instruction.* With what grade should the systematic treatment of the spelling period begin and end? What are the determining factors?

PART II

EXPERIMENTAL STUDIES IN THE TEACHING OF SPELLING

CHAPTER IV

AN EXPERIMENT IN THE TEACHING OF HOMONYMS

It is current practice in our schools to teach homonyms in pairs or groups, such as *piece, peace, colonel, kernel.* Some teachers, however, have claimed that such grouping together confuses the pupil and that it would be better to teach each word separately, with some interval of time between the two. The object of the following experiment was to determine, so far as possible, which of the two methods is the better.

The Horace Mann School is well adapted to such a study because in each grade there are two sections of the same size and of practically the same native ability. The general plan of the experiment was first to test the ability of each grade to spell certain selected homonyms, then to have these homonyms taught by the regular teacher of one room by one method, and by the teacher of the other room of that grade by the other method. After that the pupils were to be examined again on the same homonyms, and the results compared with those of the first test.

The object of the first examination was to test the ability of the pupils to spell ten pairs of homonyms as they occurred in twenty detached sentences, an effort being made not to have the pupils realize that they were being tested on these particular words. Consequently only the following explanation was made before the sentences were dictated: "I am going to dictate to you several short sentences. You will be given time enough to write each one carefully. I will pronounce each sentence twice, and no questions will be answered." Ample time was allowed, each sentence was pronounced twice so that inability to spell the word should be, so far as possible, the only reason for making a mistake. The papers were then corrected, and from the ten pairs of homonyms five pairs were selected that presented the

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greatest difficulty to the grade. The homonyms selected in this way for each grade were the following:

Grade III	Grade IV	Grade V	Grade VI	Grade VII
pair	fair	pail	rode	led
pear	fare	pale	road	lead
ate	there	to	whole	tail
eight	their	too	hole	tale
bow	seen	peace	burrow	meddle
bough	scene	piece	borough	medal
kernel	serial	dessert	aisle	ceiling
colonel	cereal	desert	isle	sealing
dual	bridle	peer	plain	feint
duel	bridal	pier	plane	faint

In arranging to have these words taught in the two rooms of each grade, great care was taken to have all the factors constant except that in one room the homonyms were to be taught side by side and in the other room with an interval of three or four days between the words of each pair. The teachers were then called together, and the exact method to be used was carefully explained. A uniform time limit of fifteen minutes was placed on the spelling lesson, and the exact words to be taught in each room were specified. The following brief outline of the method of teaching agreed upon was then placed in the hands of each teacher, together with the words to be taught, and the date of each lesson. It was further agreed that these words should not be reviewed or taught in any way other than specified.

Steps in Teaching Homonyms

	(When taught together.)	(When taught separately.)
I.	"Here are two words that are pronounced alike but spelled differently because they have different meanings. Look at them carefully." Then have pupils copy them to establish correct visualization.	"Look at this word carefully. Copy it." (To see if it is visualized correctly.)

II. Bring out meaning by concrete illustration; then let the teacher summarize by giving careful definition.

III. *Oral* application by pupils, using word in sentence; then have each pupil write a sentence using it.

Bring out in all cases the three factors of *meaning*, *sound*, and *written form*.

The following words were selected for each lesson. It will be noticed that the words to be taught in each room of a given grade are the same, the only difference being that in one room the homonyms are brought together, while in the other room they are separated.

WEDNESDAY, NOVEMBER 20

Grade III		Grade IV		Grade V	
Room 109 (Together)	*Room* 110 (Separate)	*Room* 200 (Together)	*Room* 111 (Separate)	*Room* 201 (Together)	*Room* 202 (Separate)
witch	witch	potato	potato	shoulder (noun)	shoulder (noun)
some	some	promise	promise	pigeon	pigeon
fair	fair	there	there	bow (verb)	bow (verb)
fare	pale	their	too	bough	scene
told	told	pencil	pencil	scissors	scissors
		neighbor	neighbor	cough	cough
				bureau	bureau

FRIDAY, NOVEMBER 22

ghost	ghost	cellar	cellar	alcohol	alcohol
afraid	afraid	wrong	wrong	necessary	necessary
pail	pair	hole	hole	medal	medal
pale	lead	whole	eight	meddle	burrow (verb)
ache	ache	Wednesday	Wednesday	village	village
		women	women	business	business
				bouquet	bouquet

MONDAY, NOVEMBER 25

such	such	carriage	carriage	group	group
between	between	scenery	scenery	religious	religious
rode	fare	to	to	peace	peace
road	road	too	tail	piece	bough
roof	roof	musician	musician	colonel	colonel
		ache	ache	agreeable	agreeable
				antique	antique

WEDNESDAY, NOVEMBER 27

Grade III		Grade IV		Grade V	
Room 109	*Room* 110	*Room* 200	*Room* 111	*Room* 201	*Room* 202
(Together)	Separate)	(Together)	(Separate)	(Together)	(Separate)
alone	alone	benefit	benefit	creature	creature
pretty	pretty	necessary	necessary	celery	celery
led	led	ate	ate	borough	borough
lead	pear	eight	their	burrow	meddle
who	who	autumn	autumn	pursue	pursue
		success	success	physician	physician
				service	service

TUESDAY, DECEMBER 3

noise	noise	professor	professor	parallel	parallel
shoes	shoes	biscuit	biscuit	anchor	anchor
pair	rode	tale	tale	seen	seen
pear	pail	tail	whole	scene	piece
music	music	height	height	foreigner	foreigner
		governor	governor	nuisance	nuisance
				recognize	recognize

WEDNESDAY, NOVEMBER 20

Grade VI		Grade VII	
Room 206	*Room* 203	*Room* 208	*Room* 209
(Together)	(Separate)	(Together)	(Separate)
neighbor	neighbor	acknowledge	acknowledge
rehearse	rehearse	architect	architect
prairie	prairie	alcohol	alcohol
aisle	aisle	bridle	bridle
isle	colonel	bridal	pier
disappoint	disappoint	disease	disease
delicious	delicious	liquor	liquor
mosquito	mosquito	scheme	scheme

FRIDAY, NOVEMBER 22

mucilage	mucilage	decrease	decrease
lieutenant	lieutenant	chasm	chasm
jealous	jealous	edifice	edifice
dessert	dessert	plane (verb)	plane (verb)
desert (verb)	sealing	plain	duel
scenery	scenery	politics	politics
deceive	deceive	calendar	calendar
victuals	victuals	siege	siege

MONDAY, NOVEMBER 25

Grade VI		Grade VIII	
Room 206 (Together)	*Room* 203 (Separate)	*Room* 208 (Together)	*Room* 209 (Separate)
pursuit	pursuit	secession	secession
science	science	deign	deign
biscuit	biscuit	maneuver	maneuver
kernel	kernel	peer	peer
colonel	isle	pier	feint
asylum	asylum	coupon	coupon
alcohol	alcohol	sufficiency	sufficiency
leisure	leisure	naphtha	naphtha
	WEDNESDAY, NOVEMBER 27		
cologne	cologne	mahogany	mahogany
ferocious	ferocious	virtue	virtue
exercise	exercise	successor	successor
serial	serial	dual	dual
cereal	desert (verb)	duel	bridal
scheme	scheme	courteous	courteous
yacht	yacht	service	service
brilliant	brilliant	apparatus	apparatus
	TUESDAY, DECEMBER 3		
conscience	conscience	analyze	analyze
decision	decision	decisive	decisive
character	character	cologne	cologne
ceiling	ceiling	feint	faint
sealing	cereal	faint	plain
fatigue	fatigue	mosquito	mosquito
cylinder	cylinder	parallel	parallel
carriage	carriage	hygiene	hygiene

After ten days had elapsed since the last spelling lesson, the pupils of the five grades were examined again on these homonyms. This final test was given under conditions similar to those of the first test, except that the sentences dictated were not the same, but employed the homonyms under practically the same conditions. Both the first test and the final test were conducted by the writer in person, and care was taken to give the tests to the two rooms of a grade at practically the same time in the school session so that the fatigue of the class might not be a greater factor in one room than in the other.

The papers of the first test and the final test were then examined carefully and the results tabulated as shown in Table I.

TABLE I

TOTAL DECREASE IN ERRORS

Grade	Together						Separate					
	Room	Errors on First Test	Errors on Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil 10 maximum	Room	Errors on First Test	Errors on Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil 10 maximum
III	109	142	66	76	29	*2.62*	110	148	87	61	26	*2.35*
IV	200	58	26	32	27	*1.19*	111	74	54	20	27	*.74*
V	201	101	70	31	27	*1.15*	202	136	89	47	27	*1.74*
VI	206	142	41	101	27	*3.78*	203	120	76	44	27	*1.63*
VII	208	97	29	68	25	*2.72*	209	95	54	41	26	*1.58*
						Average per Grade *2.29*						Average per Grade *1.61*

It will be seen that this summary shows a gain in efficiency for the together-method in every grade except the fifth. It is obvious, however, that such a method of comparison may not be a true measure of the relative value of the two methods. For example, if one method showed a net decrease in errors of 30, that is, a change from 100 errors on the first test to 70 errors on the final test, while another method showed a similar decrease of 30 errors, but a change from 50 errors to 20 errors, obviously the latter method would be far better, because in the former case there was more room for improvement. It was necessary, therefore, to submit the results to a different kind of comparison. This was done by computing the average gain of all those who had 1 error on the first test, then of those who had 2 errors, and so on. The results of this method of comparison are shown in Table II.

A study of Table II shows that the together-method is the more efficient in all grades. The reversal of the situation in Grade V is interesting. It will be noted that the pupils who made 8 errors on the first test, that is, the poorest spellers, made a decided gain by the together-method, so much, in fact, that the total average gain by the together-method was greater than by the separate-method.

Table III compares the good spellers as a group and the poor spellers as a group. Here again the together-method seems on the whole to be superior for both good and poor spellers, the only exceptions being for the poor spellers of Grade III and the good spellers of Grade V.

Inasmuch as the evidence in favor of the together-method was not as positive in Grade V as in the other grades, the median, the average, and the average deviation for Grade V were computed. (Table IV)

Owing to the inequality in the units of measurement, it is impossible to determine accurately from Table IV whether the together-method is superior to the separate-method. One cannot decide, for example, positively whether an improvement from 3.78 errors to 2.86 errors is greater or less than an improvement from 5.6 errors to 3.3 errors. Of course the gain in the latter case expressed numerically is greater, but this is

TABLE II

AVERAGE IMPROVEMENT AS BASED UPON GROUPS ARRANGED ACCORDING TO NUMBER OF ERRORS IN FIRST TEST

Errors on First Test	III		IV		V		VI		VII	
	Room 109, Together, Average Improv.	Room 110, Separate, Average Improv.	Room 200, Together, Average Improv.	Room 111, Separate, Average Improv.	Room 201, Together, Average Improv.	Room 202, Separate, Average Improv.	Room 206, Together, Average Improv.	Room 203, Separate, Average Improv.	Room 208, Together, Average Improv.	Room 209, Separate, Average Improv.
1	1.	...	.4	0	0	...	.5	.7	0	1.
2	1.7	0	1.1	.3	1.	—.2	1.7	1.	1.5	3.
3	2.7	2.	1.	1.1	.5	2.5	2.	0	2.3	1.
4	3.	2.7	2.3	1.	1.2	1.	3.	.6	2.9	2.
5	2.7	2.5	4.	2.	1.5	2.	5.	...	3.3	2.6
6	3.3	2.7	...	...	1.2	2.7	4.	1.5	4.5	2.
7	3.	2.7	...	...	1.5	2.	5.4	3.	4.	1.5
8	3.	1.	...	...	7.	2.5	5.7	4.5	...	...
9	...	3.5	...	...	...	...	4.7	...	...	...
10	...	3.	...	...	...	...	...	...	...	...
Total	20.4	20.1	8.8	4.4	13.	12.5	32.	11.3	18.5	13.1

offset, partially at least, but how much we do not know, by the fact that improvement was easier to secure when the median of the first test was 5.6 than when it was 3.78.

It may be said that not enough pupils were examined to establish the validity of the conclusion of this experiment. The reliability of these figures, however, has been computed with the result that beyond any reasonable doubt we may say that

TABLE III

TABLE DERIVED FROM TABLE II SHOWING IMPROVEMENT OF THE GOOD SPELLERS AS A GROUP AND OF THE POOR SPELLERS AS A GROUP

Grade	Good Spellers		Poor Spellers	
	Totals of Average Improvements by Together-Method	Totals of Average Improvements by Separate-Method	Totals of Average Improvements by Together-Method	Totals of Average Improvements by Separate-Method
III	11.1	7.2	9.3	12.9
IV	2.1	1.4	6.3	3.
V	2.7	3.3	11.2	9.2
VI	7.2	2.3	20.1	9.
VII	6.7	6.	11.8	6.1

TABLE IV

THE MEDIAN, AVERAGE, AND AVERAGE DEVIATION FOR GRADE V. FIGURES REPRESENT THE NUMBER OF ERRORS

	Together-Method		Separate-Method	
	First Test	Final Test	First Test	Final Test
Median	3.78	2.86	5.6	3.3
Average	3.3	2.9	5.5	3.2
A. D.	1.7	1.5	1.3	1.2

TABLE V

TOTAL DECREASE IN ERRORS

MONTCLAIR, N. J.

Grade	Room	Errors on First Test	Errors on Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil	Room	Errors on First Test	Errors on Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil
III	B	124	46	78	26	*3.00*	A	79	23	56	23	*2.43*
IV	B	109	58	51	37	*1.57*	A	66	37	29	31	*.93*
V	A	74	26	48	27	*1.78*	*Adv*	126	65	61	29	*2.103*
VI	B	158	47	111	23	*4.83*	A	143	42	101	30	*3.38*
VII	B	101	41	60	30	*2.00*	A	85	14	71	31	*2.29*
					143	Average per Grade *2.63*					144	Average per Grade *2.24*

the conclusion would not be changed if the number of pupils tested was increased almost indefinitely.

There is one element of uncertainty that could not be eliminated by this experiment, namely, the effect of the personality of the teacher. This can be done by trying the experiment in other schools under similar conditions. It is hoped that this may be done so that, if the same general results in favor of the together-method of teaching homonyms are obtained, a final conclusion may be reached concerning this one factor in the teaching of spelling.

This experiment has recently been tried in the Montclair, N. J., public schools, under the direction of Mr. Archibald S. Knight, Principal of the Central Schools. Mr. Knight used the same dictation tests, word lists, and teaching directions as were used in the Horace Mann School, and the results were measured by the same methods. The following summaries (Tables V and VI) show the conclusions:

It is interesting to note that the situation in Grade V was the same in Montclair as at the Horace Mann School. The separate-method according to Table V was slightly superior to the together-method, but this was reversed by the method of measurement used in Table VI. The reason for this reversal was the same as at the Horace Mann School, namely, the marked improvement of the poorer spellers.

The following quotation from Mr. Knight's letter may partially explain the fact that in Montclair the separate-method seemed superior to the together-method in Grade VII:

"This reversal in seventh grade results may be due entirely to the superior spelling ability possessed by VIIa pupils, although I thought that in spelling there was no great difference between the classes. In assigning the separate-method, which seems to have least in its favor, I purposely gave this method to pupils having a trifle higher scholarship average.

"However, I sought to give the tests to the classes as nearly equal in ability as possible. The together-method in most instances seems to have overcome any slight handicap that may have existed, thus furnishing quite conclusive evidence in its favor."

TABLE VI

AVERAGE IMPROVEMENT AS BASED UPON GROUPS ARRANGED ACCORDING TO NUMBER OF ERRORS ON FIRST TEST
MONTCLAIR, N. J.

Errors on First Test	Grade III		Grade IV		Grade V		Grade VI		Grade VII	
	Room 3B, Together, Average Improv.	Room 3A, Separate, Average Improv.	Room 4B, Together, Average Improv.	Room 4A, Separate, Average Improv.	Room 5A, Together, Average Improv.	Room 5 adv., Separate, Average Improv.	Room 6B, Together, Average Improv.	Room 6A, Separate, Average Improv.	Room 7B, Together, Average Improv.	Room 7A, Separate, Average Improv.
1	.5	.6	0	0	.3	1.	1.	1.	—.6+	.6+
2	1.	.5	.5	1.5	1.	1.3	—2.	1.6+	.8	1.8
3	.3	2.	2.	1.	1.	.8	2.	2.	2.4	.3
4	3.	4.	2.5	2.8	3.	1.7	2.5	3.	2.	3.5
5	2.7	4.	4.5	4.	3.	3.2	3.2	2.	4.	5.
6	4.	3.7	4.5	3.	...	2.3	5.	5.	4.	5.5
7	3.5	...	2.	3.	6.	2.5	6.	4.8	5.	4.
8	7.5	...	...	...	...	4.6	...	6.	...	...
9	7.	7.	4.	...	9.	...	6.	6.	6.	...
10	...	...	...	...	6.	...	9.	...	...	7.
11	6.5	...	...	...	...	...	...	9.	...	...
12	...	...	...	...	...	...	7.5	...	...	...
Totals	36.	21.8	20.0	15.3	29.3	17.4	40.2	40.4	23.6	30.4

CHAPTER V

STUDIES IN COMPARISON OF THE CLASS STUDY AND INDEPENDENT STUDY METHODS

A very common method of teaching spelling is for the teacher to assign to the class a certain number of words from the spelling text-book or from lists of selected words. The pupil learns these words by himself as best he may, and is subsequently tested by the teacher in the spelling recitation. In assigning these words the teacher often makes a practice of being sure that her pupils understand the meaning of the words, and possibly of calling to the pupil's attention certain difficulties in spelling. It is the pupil's business, however, to master the spelling of the assigned words in his own way, using any methods of drill that he sees fit. The teacher's part in the process is to define clearly for her pupils the task in hand, to point out specific letters or syllables that need special emphasis, and above all to test the pupils upon the results of their independent study. It is probably fair to assume that the above description with some modifications represents the use that is made of the spelling period in a majority of our schools.

The results obtained from such methods of independent study have not been satisfactory; at least the studies of Rice, Cornman, and others show that there is no relation between the time spent upon such instruction and the resulting spelling ability. These studies seem to indicate, not that spelling cannot be taught formally, but that the prevailing type of instruction is defective. During the past three years, we have been conducting in the Horace Mann Elementary School a series of experiments to find a more efficient way of utilizing the ten or fifteen minutes set aside on the daily program for formal instruction in spelling.

First Experiment

On considering the problem, it appeared probable that the chief defects of the prevailing method lay in the child's lack of concentrated attention, in his inability to select the words or parts of words that required special study, and in his technique of drill. The obvious means of controlling these factors was to do away with outside, independent study, and to have all the drill and study carried on under the supervision of the teacher during the recitation period. In other words, the teacher should teach and direct the learning process rather than merely test results.

The problem was, therefore, to compare the effectiveness of a series of recitations of the customary or independent type with a series of the class study type, where the learning process was wholly under the control of the teacher. The general plan of investigation involved experiments of the comparative type similar to the homonym experiment.

For the first experiment two rooms were selected from Grade IV, two from Grade V, and two from Grade VI. First the pupils of each grade were examined, through dictated sentences, upon their ability to spell in context a list of selected words; then these words were taught in one room by the class study method and in the other by the independent study method. The words selected for each grade and the dates assigned for teaching follow.

GRADE IV

Nov. 6th	Nov. 9th	Nov. 10th	Nov. 11th	Nov. 12th
uncle	fierce	necessary	laziness	height
geography	envelope	tongue	their	mischief
practice	thief	measles	there	parade
nephew	neighbor	distance	election	guilt
daughter	marriage	Wednesday	holiday	balloon

GRADE V

Nov. 6th	Nov. 9th	Nov. 10th	Nov. 11th	Nov. 12th
cologne	cruise	schooner	received	parallel
choir	mechanic	mosquito	yacht	disease
absence	rogue	physician	muscles	capsized
kernel	aisle	odor	alcohol	interruption
salary	molasses	clothes	gasolene	nuisance
foreigner	debt	excusable	itches	horizontal

GRADE VI

Nov. 6th	Nov. 9th	Nov. 10th	Nov. 11th	Nov. 12th
leisure	dyspepsia	gymnasium	hospital	ingenuity
disease	picturesque	luncheon	infectious	chasm
fascinated	amateur	Czar	yacht	administration
pneumonia	architect	cruise	increasing	scenery
sagacious	engineer	analyzed	precision	contagious
scheme	apparatus	shrewd	malicious	changeable
salary	laughter	fatiguing	sovereign	dissatisfied

Teachers using the class study method were limited strictly to a fifteen-minute period and no outside study by the pupils was allowed. The recitation period for the independent study group was likewise limited to fifteen minutes, but no restriction was placed upon the pupils as to outside study. After ten days had elapsed since teaching the last group of words, the pupils of both rooms of each grade were examined by dictated sentences upon their knowledge of the words that had been taught. This final examination was similar to the first, and was conducted by the same person. By comparing the results of these two examinations, therefore, we could measure the improvement resulting from the two methods of teaching. The following table summarizes these results from one point of view:

TABLE VII

RESULTS OF THE TWO METHODS

Grade	Class Study Groups			Independent Study Groups		
	Errors on First Test	Errors on Final Test	Average Decrease per Pupil	Errors on First Test	Errors on Final Test	Average Decrease per Pupil
IV 25 words	429	323	*4.4* 24 pupils	454	171	*11.8* 24 pupils
V 30 words	600	332	*10.3* 26 pupils	550	210	*13.6* 25 pupils
VI 35 words	501	176	*12.5* 26 pupils	732	459	*9.7* 28 pupils

This comparison of the average decrease in errors per pupil resulting from the two methods, shows a decided gain in favor of the independent study method in Grades IV and V, but not in Grade VI. The situation in the latter grade is explained, partially at least, by a difference in teaching efficiency. On the whole, however, results favor the independent study groups; but we should not be surprised at this when we consider that these pupils probably studied the words outside the recitation, while the class study group did not. In other words, the time factor in the two groups differed considerably.

This comparison of the two methods was made early in the school year in November. Arrangements were then made with the teachers of these six rooms to continue using the same methods until the end of the school year, so that there would be one group of teachers using the class study method, with no outside preparation of the lessons, and another group teaching by the independent study method and demanding of their pupils as much home study as was necessary to prepare their lessons. In May we planned to test both groups on their power to learn a given group of words by the independent study method. Our purpose was to see whether those pupils who had been taught by the class study method for the intervening five months learned better when left to their own resources, than those pupils who had been using the independent method. In other words, we wished to get some evidence as to whether a method of learning imposed upon a pupil by the teacher tended to become the pupil's individual habit of learning when he is left to his own devices. The pupils in these six rooms were first tested upon their knowledge of the following words:

Grade IV	Grade V	Grade VI
grate	dismissed	expanse
glowing	nasal	dismal
midst	psalm	tapping
ruddy	duck	cowering
forth	tales	panes
blazing	stretch	hedgerows
volume	bordering	lattice
Christmas	wended	shivering
squire	imagination	clumps
tales	resource	beseeching

Then directions like the following were given the two teachers in each grade:

GRADE IV

DIRECTIONS FOR TEACHERS

Teach the following words on the days specified by the method indicated below. Spend exactly 20 minutes each day.

Wednesday, April 28

grate, glowing, midst, ruddy, forth.

Thursday, April 29

blazing, volume, Christmas, squire, tales.

METHOD

Independent Study

1. Write the five words on the board.
2. Pronounce each word clearly and develop its meaning, having pupils use it in oral sentence.
3. Without any suggestion as to method, allow pupils to study the five words by themselves in any way they wish.
4. Test pupils on these five words in the usual way, first pronouncing each word in a sentence and then repeating it singly.
5. Do not teach these words again or refer to them in any way until the final test is given.

Ten days after teaching the last group of words, the pupils were re-examined upon their knowledge of these ten words by a dictation test similar to the one given first. The following table gives the results of a comparison of these two tests:

TABLE VIII

Grade	Rooms using Class Study Method during the Year			Rooms using Independent Study Method during the Year		
	Errors on First Test	Errors on Final Test	Average Decrease per pupil Maximum 10	Errors on First Test	Errors on Final Test	Average Decrease per pupil Maximum 10
IV	80	32	*2.1* 23 pupils	84	13	*3.4* 21 pupils
V	114	69	*1.95* 23 pupils	115	64	*2.12* 24 pupils
VI	90	17	*2.51* 29 pupils	107	45	*2.48* 25 pupils

Compare this table with that on page 51. In the November comparison of the two rooms of Grade IV, we find that the class study group made an average decrease per pupil of 4.4 words, and the independent study group, of 11.8 words; while in the May comparison the class study group showed an average decrease per pupil of *2.1* words and the independent study group, of *3.4* words. That is to say, the class study room as compared with the independent study room did better in May than in November. A study of Grade V results also shows a similar gain. The results in Grade VI, however, show the reverse, for here the class study room as compared with the independent study room did not do so well in May as in November. There is some evidence, therefore, to show that the methods of learning spelling acquired by the class study group were somewhat more effective than the independent study methods, although this evidence is not very convincing.

The results of this experiment as a whole are rather inconclusive, and this is due to the fact that in arranging the conditions of the comparison several factors were overlooked. The experiment has been reported, however, to indicate a problem for investigation that deserves a more thorough and careful treatment, and to show at the same time how difficult it is to foresee all the situations that will arise in conducting experiments of this type. For example, after conducting the May comparison it was found that the directions given to the teachers were not sufficiently explicit. While the time limit for the whole teaching lesson was given, no specified time was mentioned for individual study, so that one teacher might possibly have given her class ten minutes for study and another fifteen minutes. This oversight alone might have caused sufficient variation to make impossible an accurate comparison. Then again it was not definitely said that no outside study should be allowed, and we afterward found that two teachers did permit additional study. For these and other reasons we do not place much value on these results, and have not, consequently, submitted these figures to a more careful statistical analysis. We hope to perform this experiment again, taking care to avoid

the errors that our experience showed were made in our first attempt.

Second Experiment

The November comparison in the first experiment gave rather strong evidence in favor of independent study, but, as has been pointed out, it is possible that the failure to limit the home study of the independent study groups may have been an important factor in producing these results. This suspicion led to the arrangement of a second experiment with pupils of Grades III and VII, in which the time limit of the recitation was increased to twenty minutes and no outside study allowed for either group.

As before the two rooms of each grade were first tested through dictation upon a selected group of words, then one room was taught these words by the independent study method, and the other by the class study method. The directions for teaching given to the teachers were the following:

STEPS IN TEACHING SPELLING

Independent Study

Time limit—twenty minutes

1. Write words on blackboard and explain meaning.
2. Pronounce and spell aloud *by syllables* once each word.
3. Have pupils give sentences using each of the words.
4. Have pupils study the words by themselves, without any suggestion from the teacher as to method.
5. Then erase all words from blackboard and dictate the words to the class, using each word in a sentence first. It is well also to dictate, if possible, the review words of the previous lesson. Keep these spelling papers so that pupils may not study the words outside.

Class Study

Time limit—twenty minutes

1. Write one of the words on the blackboard and teach it in accordance with the following plan. Then write the next word, teaching it in the same way, and so on with the rest of the words.
   (a) While writing the word, *pronounce* it distinctly.
   (b) Develop the meaning orally either by calling for a sentence using the word or by giving its definition.

(c) Divide word into syllables. Call on pupils to spell orally by syllables. Have them indicate what part of the word presents difficulties, or whether the word contains parts they already know.

(d) Have pupils write the word, pronouncing it softly as they write. It would be well to have given a new sentence using the word before they do this. This is to emphasize strongly the meaning of the word again just before the child writes it.

(e) Allow the class a moment in which to look at the word again and then have them close eyes and try to visualize it, or use any other device of a similar nature. Have considerable repetition, both oral and written.

2. After the various words of the day's lesson have been studied in this way, allow a few moments for studying again the whole list, suggesting that each pupil emphasize the words he thinks he doesn't know. This time should be limited so that every pupil will attend vigorously and intensively. Call upon pupils individually and in concert to spell the whole list without looking at the board. Refer them to the board again if they hesitate.

3. Then erase all words from blackboard and dictate the words to the class, using each word in a sentence first. Keep these spelling papers so that pupils may not study the words outside.

After a lapse of ten days the final test on these words was given, and the results of the first and final tests were compared as before. The following table presents the results of this comparison:

TABLE IX

TOTAL DECREASE IN ERRORS

	Errors on First Test	Errors on Final Test	Total Decrease	Number of Pupils	Average Decrease per Pupil. Maximum 15
Grade III					
Class Study Room.....	374	222	152	29	*5.24*
Independent Study Room..	364	245	119	27	*4.40*
Grade VII					
Class Study Room.....	163	56	107	24	*4.46*
Independent Study Room..	148	43	105	26	*4.04*

An inspection of this table shows that the class study method was more effective than the independent study method in both grades, because it eliminated more errors.

Third Experiment

In all experiments of the comparative type, it is very important to have all conditions in the two groups of pupils that are being compared identical except for the one element of variation that is being tested. Of course it is almost impossible to select two teachers or groups of teachers who possess exactly the same teaching ability; consequently, it is difficult to eliminate altogether this source of error. One way of reducing it to a negligible quantity is to have the same experiment performed in a large number of schools. Another way is to exchange the teachers using the controverted methods. Still another way is to have the same teacher use with the same pupils the two methods of teaching that are to be compared.

This experiment is an attempt to carry out the latter plan, and is again a study of the relative effectiveness of class study and independent study. Two additional variations of the preceding experiment were provided. First, the interval between the last teaching and the final test was increased from ten days to twenty-four days, so as to be surer that the final examination tested a more permanent acquisition of the pupils. Second, the independent study recitation periods were eighteen minutes, while the class study recitations were only fifteen minutes. In both cases no outside study was permitted. This experiment was carried on in Grades IV, V, VI and VII, and the testing and teaching in all these grades by both methods was done by the same teacher.

The pupils of a room in each of these grades were first tested on October 22nd upon their knowledge of the following selected words:

Grade IV

wrecked	shepherd	carefully	wrong
Tuesday	separate	sentences	listening
family	believe	write	music
squirrels	received	right	anxious
autumn	neighbor	mischief	trouble
			20 words

GRADE V

necessary	reigned	ascent	especially
scissors	ancient	perilous	anxious
business	lieutenant	niece	musician
judgment	authority	absent	mischievous
character	preparation	college	guilty
monarch	wrestling	February	wrong
			24 words

GRADE VI

ancient	important	February	region
Christians	business	believe	descendants
obliged	engagement	government	possession
worship	Wednesday	conqueror	generation
conducted	knight	frontier	parallels
successful	reign	separate	latitude
expedition	necessary	excursions	meridians
enemies	college	uncivilized	longitude
			32 words

GRADE VII

persistence	admirable	discussed	engineer
sagacious	serenade	cession	proceeded
resistance	admiral	hostile	crevasse
opponent	capacious	fertile	levee
lieutenant	surgeon	capable	accepted
garrison	Cincinnati	counselor	except
equipped	martyr	preceded	detestable
discipline	session	austere	colonel
			32 words

These words were taught in four groups on October 25th, 26th, 28th, 29th, by the following method:

CLASS STUDY METHOD

Time limit: 15 minutes, including the dictation

1. The first word was written on the board in the presence of the class, and then studied as follows:
   (a) Its meaning was given, and used in a sentence.
   (b) It was spelled aloud in concert, and individually by the poor spellers.
   (c) Its peculiarities, such as silent letters, ei and ie combinations, etc., were pointed out.
   (d) The word was written once, twice, or three times by pupils who spelled it silently as they wrote.
2. Each word in turn was written on the board and studied in this same way.

3. Next, the whole column was reviewed orally, the children first spelling each word from the board and then, turning from the board, spelling again (either silently or aloud) and verifying results by consulting the board.

4. The words were then erased from the board, practice papers put out of sight, and the work dictated.

The final dictation test on all these words was given on November 22nd. A comparison of the results of this test and those of October 22nd gives, therefore, an accurate measure of the effectiveness of the teaching of these words by the class study method in these four grades.

About a week after the teaching of the preceding groups of words, the same pupils were tested through dictation upon their knowledge of another selected list of words of about the same difficulty as the first list. The following are the words chosen for each grade:

GRADE IV

empties	fiercely	patient	obeyed
ocean	roughly	succeed	climbed
governor	eagerly	know	carriage
surrounded	answered	hymn	strength
soldiers	question	usually	journey

20 words

GRADE V

reindeer	possession	pigeons	successful
arctic	mountainous	immediately	surgeon
regions	uncivilized	disappeared	conqueror
prairies	measured	independent	aisle
extremely	height	government	physician
fertile	column	skillful	medicine

24 words

GRADE VI

soldiers	shepherd	double	decision
despair	independent	column	encouraged
weapons	solemn	physician	education
decide	promise	careless	foreigners
volume	immediate	complete	envious
choose	attention	failure	suspicious
apologies	military	listened	ancestor
trouble	regiment	eagerly	character

32 words

GRADE VII

opportunity	secede	succeeded	complement
spinach	possession	mercantile	familiar
asparagus	archipelago	business	geyser
celery	compliment	thorough	sensible
alligator	appropriate	challenge	muscles
muscular	capacity	navigable	kernel
agile	similar	destructive	choked
Connecticut	audacity	cyclone	examine

32 words

These words were then taught in four groups on November 8th, 9th, 11th, 12th, by the following method:

INDEPENDENT STUDY METHOD

Time limit: 18 minutes, including dictation

1. The words were written on the board in a column, pronounced, used in a sentence or their meaning given.
2. Then the pupils were allowed to study them independently, without any suggestion from the teacher as to method.
3. At the close of the study period, the words were dictated in sentences.

On December 6th, after an interval of twenty-four days, a final dictation test on all these words was given, and the results compared with those of the first test on November 5th, thus giving a measure of the gain made by the independent study method.

Table X compares the gains made by the two methods, and shows the total decrease in errors.

This table indicates very clearly the marked superiority of the class study method, showing as it does that this method, eliminated from 36 per cent to 100 per cent more errors than the independent study method.

It may be said, in objection, that the two groups of words were not of equal difficulty, but the totals of the numbers of errors on the first test, 1277 for the independent study group and 1317 for the class study group, show that they were about equally unknown to the pupils. Whether they were equally difficult to learn is a matter of personal judgment, as we have no accurate way of measuring such facts.

TABLE X

TOTAL DECREASE IN ERRORS

Grade	Independent Study						Class Study					
	Room	First Test	Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil	Room	First Test	Final Test	Net Decrease	Number of Pupils	Average Decrease per Pupil
IV	111	286	228	58	22	*2.63* maximum 20	111	275	144	131	22	*5.95* maximum 20
V	201	291	208	83	20	*4.15* maximum 24	201	291	108	183	20	*9.15* maximum 24
VI	206	349	221	128	23	*5.56* maximum 32	206	363	143	220	23	*9.56* maximum 32
VII	209	351	218	133	20	*6.65* maximum 32	209	388	206	182	20	*9.10* maximum 32
		1277				Average Decrease per Grade *4.74*		*1317*				Average Decrease per Grade *8.44*

As has been explained in the homonym experiment, a comparison like Table X, showing the total decrease in errors, may not be an accurate measure of growth. To say, for example, two pupils have each eliminated five errors does not necessarily mean that they have made the same improvement, for obviously it indicates more growth to have changed from eight errors on the first test to three on the final test than to have moved from fifteen errors on the first test to ten errors on the final test. In order to take account of this fact, a comparison of results upon a different basis was made. The average improvement of those who made one error on the first test was computed, and then that of those who made two errors, and so on. Table XI shows the totals of these average improvements.

TABLE XI

THE TOTALS OF THE AVERAGE IMPROVEMENTS AS BASED UPON THE NUMBER OF ERRORS IN THE FIRST TEST

Grade	Total of Average Improvements by *Independent* Study	Total of Average Improvements by *Class* Study	Total Gain of *Class* Study Over *Independent* Study
IV	26.3	77.6	51.3 or *195%*
V	47.7	112.3	64.6 or *135%*
VI	97.	148.4	51.4 or *53%*
VII	83.5	123.3	39.8 or *47.6%*

This table again shows the marked superiority of the class study method.

Another interesting summary is that which compares the good spellers of one method with the good spellers of the other method, and the poor spellers with the poor spellers. This is easily secured by adding the average improvements of the better half of each class, and the same for the poorer half. Table XII gives the result of such a computation.

Here again we see that both the better spellers and the poorer spellers profited more from the class study method than from the independent method, although the better spellers gained more on the whole than the poorer ones.

TABLE XII

THE TOTALS OF THE AVERAGE IMPROVEMENTS OF THE POORER SPELLERS AS COMPARED WITH THE BETTER SPELLERS

Grade		Total of Average Improvements by *Independent* Study	Total of Average Improvements by *Class* Study	Total Gain of *Class* Study Over *Independent* Study
IV	Better Spellers	4.3	40.1	35.8 or *832%*
	Poorer Spellers	21.0	34.5	13.5 or *64%*
V	Better Spellers	15.5	54.5	39.0 or *251%*
	Poorer Spellers	32.2	52.8	20.6 or *64%*
VI	Better Spellers	34.0	46.5	12.5 or *37%*
	Poorer Spellers	60.5	101.9	41.4 or *68%*
VII	Better Spellers	35.0	61.0	26.0 or *74%*
	Poorer Spellers	46.5	62.3	15.8 or *34%*

The evidence of this experiment, therefore, from whatever angle we study it, shows that teaching of the class study type is far more effective than the independent study type. The ambitious teacher, who is anxious to make the fifteen minute spelling most effective, will probably get the best results from spending that time in drilling her pupils by some such method as that described as the class study method.

FOURTH EXPERIMENT

While the results of the third experiment were overwhelmingly in favor of class teaching, it was felt that the conditions imposed upon the independent study group were a bit artificial and did not conform wholly with the normal school room situation. The following year, therefore, we planned a fourth experiment that would provide three essential variations from the third experiment. First, the time limit for the independent study method recitation was extended to twenty-five minutes

so that a full fifteen minutes might be left for individual study. Second, in presenting to the class the list of words for independent study, the teacher took a few minutes to point out the peculiarities and difficulties of spelling. We felt that many teachers did this, and we wished to have the conditions surrounding the independent study group approximate more closely the conventional method of teaching. Third, we wished to find out what would be the effect of having the teaching done by a different instructor, and particularly by one who was not accustomed to using the class study method. The teacher who worked out the third experiment was more expert in handling the class study type of teaching, because she had used it for about a year in her own room.

Aside from these three variations the conditions of the fourth experiment were exactly like those of the third. The same words were selected for teaching, the same dictated sentences for testing, and the same individual did the teaching by the two methods. The different steps in class study teaching were the same as used before, but the independent study method may be described as follows: The words were written on the board in a column, then pronounced, used in a sentence or their meaning given. Next, the peculiarities or difficulties of spelling were briefly pointed out. About five minutes were devoted to this portion of the lesson. Then the pupils were given fifteen minutes for quiet, undivided study, without any direction from the teacher. After this, about five minutes were spent in testing the pupils by dictation.

On the whole, therefore, we see that the conditions were much more unfavorable for the class study method than in the third experiment, since a recitation period of fifteen minutes was to be compared with one of twenty-five minutes, and the class study method was to be used by a teacher relatively unfamiliar with it. The essential difference was that the drill in one case was to be controlled by the teacher, and in the other case left to the pupil.

A summary of the results showing the total decrease in errors is presented in Table XIII.

TABLE XIII

TOTAL DECREASE IN ERRORS

Grade	Independent Study					Class Study				
	Errors on First Test	Errors on Final Test	Decrease in Errors	Number of Pupils	Average Decrease per Pupil	Errors on First Test	Errors on Final Test	Decrease in Errors	Number of Pupils	Average Decrease per Pupil
IV	241	76	165	19	20 maximum *8.6*	242	90	152	22	20 maximum *7.*
VI	269	189	80	20	32 maximum *4.*	320	202	118	26	32 maximum *4.5*

This table shows that the class study method was slightly superior in Grade VI, and the independent method superior in Grade IV.

Considering that the words used in the third and fourth experiments were the same, it is interesting to see whether pupils under the independent study method with a recitation period of twenty-five minutes did better than those with an eighteen minute period. By comparing the average decrease per pupil in the above table with that of Table X of the third experiment, we see that the longer recitation period brought better results in Grade IV, but not so good results in Grade VI. Of course, this surprising result may be partially due to a possible inequality in ability of the grades in the two years, but it leads us to suspect that increased time for independent study does not always bring a proportionate gain in results.

Table XIV presents another comparison of results based upon the average improvements of groups classified according to the number of errors on the first test.

This table confirms the results of Table XIII, showing a gain for the class study method in Grade VI, but about an equal loss in Grade IV. Taking the evidence as a whole, therefore, we may say that the class study method was about as efficient as

the independent study method in spite of the marked inequality in the time element.

TABLE XIV

TOTALS OF AVERAGE IMPROVEMENTS OF GROUPS ACCORDING TO NUMBER OF ERRORS ON FIRST TEST

Grade	Total of Average Improvements by Independent Study	Total of Average Improvements by Class Study	Gain
IV	101.5	72.2	29.3 Gain by Independent Study
VI	46.	7.29	26.9 Gain by Class Study

The teacher conducting this experiment, who was not experienced in using the class study method, felt that she could get much better results a second time from the class study method after she had become more familiar with it.

THE PRESENT TEACHING OF MATHEMATICS IN GERMANY

By

DAVID EUGENE SMITH

WITH THE CO-OPERATION OF VARIOUS GRADUATE STUDENTS

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